



# Code Development Proposal

2002 Outdoor Lighting Efficiency Standards Development

## *Internally Illuminated Signs – Proposed Channel Letter & Box Sign, System Efficacy Standards*

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## **Proposer Name:**

The Pacific Gas and Electric Company (PG&E) is a distribution utility company, which provides natural gas and electric service to approximately 13 million people throughout a 70,000-square-mile service area in northern and central California. PG&E has provided services for over 50 years to help its customers make the most effective use of the energy they purchase.

In 1997, the California Public Utilities Commission authorized and funded an Energy Standards Program, which PG&E had developed, proposed, and filed. This public purpose energy-efficiency program was intended to allow PG&E to advocate for various Energy Standards Improvements, thereby converting to standards, measures it had encouraged within its energy efficiency rebate programs. The Energy Standards program has operated continuously since then, identifying improvement opportunities, developing Code and Standards Enhancement (CASE) studies supporting their merit, and advocating for their adoption.

This proposal is submitted as part of PG&E's Codes and Standards program.

## **Measure Title:**

Internally Illuminated Signs – Proposed Channel Letter & Box Sign, System Efficacy Standards.

## **Description:**

Channel letter signs consist of sheet metal, letter-shaped enclosures covered by translucent plastic. They form the name of the business being advertised, such as Safeway, Radio Shack, or Wells Fargo, and are used both indoors in shopping malls, and outdoors. These signs typically range from 1 to 2 feet in height, but may be found up to 4 feet and over. Neon tubes or incandescent lamps are the usual source of illumination.

Box signs consist of large rectangular sheet metal enclosures covered by translucent plastic with luminous or non-luminous (positive or negative) lettering or images. These signs are normally illuminated with fluorescent or incandescent lamps.

This proposed standard suggests that minimum lamp-ballast efficacy standards be set for internally illuminated signs, effectively requiring the superior efficacy of Light Emitting Diodes for Channel Letter Signs and T 8 fluorescent lamps with electronic ballasts for Box Signs, or systems of similar performance.

The proposed standard would include a requirement for reduced or curtailed luminance operation during the early morning hours when the supported facility is not open 24 hours per day.

## **Benefits:**

While not measured on the same basis as neon tubes, light emitting diodes are much more efficacious than neon as a source of luminance in signs. Channel letter signs are normally illuminated by neon lamps operating at power levels in the range of 11.5 watts per foot of neon tube, while LED's operate in the range of .5 to 2 Watts per foot for equivalent luminance. Benefits of LED's for channel letter signs of equivalent luminance are as follows:

- Demand reduction and energy savings in the range of 80 to 90% are possible.

- LED's are nearly monochromatic, allowing light loss to be minimized by matching them to the color of the translucent filter.
- LED's are long-lived, with estimates of mean time between failures in the range of 100,000 hours.
- LED's offer improved safety by operating at low voltages (12 volts, direct current), compared to the 12,000 to 15,000 volt alternating current that neon tubes require.
- The proposed standard, being performance based, is open to other technologies that may achieve the specified level of performance.

Box signs operated with T 8 fluorescent lamps and electronic ballasts can achieve demand reduction and energy savings of 30%, typically, for equivalent lumen output. Additionally, 2<sup>nd</sup> generation fluorescent lamps have longer lives and better lumen maintenance than their T 12 counterparts.

Reduced luminance during the early morning hours will reduce electrical demand and save energy when few are likely to see the sign and light trespass may be an issue.

## **Environmental Impacts:**

There are no negative environmental impacts associated with this recommendation.

## **Enforcement Mechanism:**

Local enforcement authorities, as proposed for the other outdoor lighting measures, will enforce this measure. Signs are normally affixed to buildings, so enforcement might be through a mandatory measure under Title 24. Trade-offs under the prescriptive method should not be allowed, since signs are a substantially different end-use than other measures within building systems. Since local planning commissions have jurisdiction over sign ordinances, recommendations could be made to cities for including specified language in local sign ordinances for attached and/or detached internally illuminated signs. Signs sold in the state could be subject to regulation under the Appliance Standard, Title 20.

## **Regulatory Approaches:**

The channel letter standard is proposed as a lighting power density measure, with the exception that the power is expressed as a function of letter centerline distance, summed for the entire sign to the nearest foot (equivalent length of neon) as opposed to area expressed in square feet. Power input would be limited to something in the range of 2 to 4 Watts per foot of equivalent length of neon, allowing adequate luminance from LED's but more efficacious than the 10 to 12 Watt per foot level necessary to power neon or incandescent sources.

The box sign standard is proposed as a lamp-ballast system efficacy standard, expressed in lumens per watt. Lamp-ballast system efficacy would be set in the range of 60-80 lumens per watt, necessitating T 8 fluorescent lamp and electronic ballast, LED, or other technology more efficacious than can be achieved by T 12 fluorescent lamps and magnetic ballasts.

Neither approach would regulate bare lamp neon signs used as a form of art. Neither would specify sign luminance, but that might be the subject of other regulation proposed in Outdoor Lighting Standard Setting Proceeding.

Reduced luminance would be specified in the early morning hours by some criteria requiring an easily obtainable multiple of the number of LED's or lamps in the sign, perhaps 50%, be switched off by controls, or the system could be dimmed to 50%.

## **Considerations for Proposed Lighting Technologies:**

This proposed standard is a performance specification, however there is only one known technology through which it can be achieved. Therefore measure availability and cost, and useful life, persistence, and maintenance are addressed.

- **Measure Availability and Cost:** LED modules are readily available from at least half a dozen suppliers for the channel letter lighting application. Their cost is approximately double the neon equivalent, but economies of scale should allow the cost of LED modules to approach neon as the market volume builds.
- **Useful Life, Persistence and Maintenance:** LED's are represented by their manufacturers to have useful lives approaching 100,000 hours. They are inherently less fragile than neon tubing, and their low voltage power supplies and wiring are more robust and safer than high voltage wiring and connections.
- **T 8 fluorescent lamps and electronic ballasts** are a common and well-known technology is lighting, readily adaptable to the sign industry.

### **Performance Verification:**

Commissioning and/or performance verification, other than inspection to assure compliance, is not required. The sign manufacturers / sign industry could self-certify compliance with State of California requirements, as is the currently the case with some Title 20 measures.

### **Technical Feasibility:**

The proposed performance levels can easily be met with existing LED and T 8 and electronic ballast technology. The materials necessary to achieve these performance levels are currently in production and readily available from a number of suppliers. Signs achieving the proposed performance levels are currently in production and major chain store owners are considering conversions.

### **Cost Effectiveness:**

The channel sign conversion was found to be cost-effective and will be offered in the statewide utility Express Efficiency program for 2002. Where the incremental cost is in the range of double, and the savings are in excess of 85%, it cost-effectiveness of the channel letter sign proposal will be easily shown.

The incremental cost of T8 fluorescent lamps and electronic ballasts is low, while the demand reduction and energy savings is in the range of 30%. This technology has been shown to be cost effective for commercial building lighting and has been effectively required by Title 24 for several years. This measure, already proven cost effective for buildings, should be extended to signs.

### **Compliance Documentation:**

Compliance will be documented by manufacturer's measurements and subsequent certification.